OBSERVATIONS ON THE "GUEST ANT" *FORMICOXENUS NITIDULUS* NYLANDER IN NESTS OF THE WOOD ANTS *FORMICA RUFA* L. AND *F. LUGUBRIS* ZETTERSTEDT IN 1998

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Abstract.—Observations made in 1997 on *Formicoxenus nitidulus* (Nyl.) were extended during 1998, including occurrence with *F. lugubris*. The behaviour of males attempting to mate with a worker, after an apparent mating emergence on a nest of *Formica rufa*, is described. It is concluded that the males, which are wingless, continue to appear on the surface of a nest for the rest of the season after a mating emergence has taken place. Therefore what was judged to have been a synchronized emergence of males on numerous nests in 1997 may simply have been the consequence of earlier, but not necessarily synchronized, emergences.

INTRODUCTION

Formicoxenus nitidulus is a small (c. 3 mm) myrmecine ant which lives as an inquiline within the large mound nests of the wood-ant *Formica rufa* and related species (e.g. *F. lugubris* Zett. and *F. aquilonia* Yarrow). It nests in small colonies within the host's nest and therefore is seldom seen except when workers, males or winged queens emerge onto the surface of the nest. In 1998 I extended the observations, which I made in 1997 (Robinson, 1998).

OCCURRENCE WITH *FORMICA RUFA*

On 23.iv.1998 at Gait Barrows NNR, Lancashire (SD483774), when Cedric Collingwood delved into a nest of *F. rufa* to confirm that it contained numerous queens (Collingwood & Robinson, 1999), I found 2 workers of *Formicoxenus* on the inner nest material. These were the first workers I had seen, since all the individuals I had found on nests in autumn 1997 were males or, rarely, dealate queens. The earliest date on which I saw males in 1998 was 2 August, on the nest where in 1997 I had seen them emerging onto a limestone slab, which they did again on 27 August. The last date was 18 October. By this time all the nests were very wet and mostly inactive, after which further rain terminated observations. Between these dates I saw males on 11 nests (as opposed to 16 in 1997), 8 of which were nests where I had not seen them before, though I was unable to find them on 5 nests where I had seen them in 1997. This supported my 1997 conclusion that they were present throughout the *F. rufa* population on the Reserve, but suggested that one could not rely on seeing them on the same nests every year.

On 29.viii.1998 at Arnside Knott, Cumbria (SD452772), I saw males on the nest where I had first seen them in October 1996, and on 3 September I found them on only a second nest. On 24 September I examined 30 nests, including the ones on which I had seen males in 1997, spending my customary 5 minutes at each site, without success. I have begun to search other *F. rufa* sites for *Formicoxenus*. I found males on one nest at Heathwaite, a National Trust area of calcareous grassland, scrub and woodland adjoining the lower slopes of Arnside Knott, and on one nest in Underlaid Wood, Cumbria (SD485789).

Behaviour of *Formicoxenus males*

When examining the nests at Gait Barrows and Arnside Knott, I realized that the most likely explanation as to why I could usually rely on finding *Formicoxenus* males on nests where I had seen them earlier, while there were other nests where I did not see them at all, was that the males continue to appear on the surface of the nest after a mating emergence has taken place. The queens, which are winged, are believed to re-enter the nest after mating, or to fly other nests (Brian, 1977). The males however are wingless and are unlikely to leave the nest. My observations suggest that they continue to come out onto the surface of the nest, and run searchingly about, for the rest of the season. This has caused me to revise the conclusion I reached in 1997: that I had seen a synchronized emergence of males. It does appear that there had been a larger scale emergence of males in 1997 than in 1998, but the fact that I saw them on a large number of nests in the same period could have been the result of them continuing to appear after earlier, but not necessarily synchronized, emergences.

On 29.viii.1998 at Heathwaite, I witnessed what appears to have been a mating emergence. On this site the *F. rufa* nests are concealed in scrub, unlike Arnside Knott, where they are mostly on woodland edges or beside paths. On a very large nest in the dense shade of a hazel–ash–yew clump, where a chink of sunlight penetrated, I saw a glistening knot of *Formicoxenus*, which I seized and tubed with a large pinch of the surface nest material. At home I found that the tube contained 5 males, vigorously pursuing another individual, only slightly larger and similarly coloured, (orange thorax contrasting with red head and abdomen), which turned out to be a worker. I had found dealate queens in 1997 and they are noticeably longer than the males and uniformly red in colour. This worker was so like a male that it was not until it extruded its sting that I was quite sure of its identity. Holding the tube under a binocular microscope, I was able to watch the males' attempted mating behaviour. One would mount the worker, extending its lyre-shaped antennae over the worker's head, rapidly palpating her head and the inner sides of her antennae, while curling the tip of his abdomen round and under that of the worker, probing (unsuccessfully) with his everted genitalia. Quite often another male would mount on top of the first. The frenzied behaviour of the males suggested that a queen had originally been present, but evidently not in the sample which I had collected. I continued to see numerous *Formicoxenus* males on the surface of this nest on subsequent visits, until 27 September.

Occurrence with *Formica lugubris*

In the north west of England *F. rufa* is now mainly confined to limestone sites in the Arnside-Silverdale AONB, which straddles the boundary between Lancashire and Cumbria. *F. lugubris* is an upland species which occurs in the Pennines, Scotland and in the Lake District where it has a very restricted distribution, being confined to woodlands in the Borrowdale and Duddon valleys. It closely resembles *F. rufa*. and is distinguished only by details of its hairiness (Bolton & Collingwood, 1975). However it has very different ecological preferences, being tolerant of wetter, and requiring cooler, conditions than *F. rufa* (Cedric Collingwood, *pers. comm.*). It also has a noticeably different colony structure, as its nests are much more commonly linked by trails into social complexes than those of *F. rufa*.

In Borrowdale *F. lugubris* nests can be seen in the oak–birch woodlands along the narrow road from Lodore to Watendlath. On 17 September I examined 3 nests near Ashness Bridge (NY270197) for *Formicoxenus*, and 10 nests in Lodore Woods

(NY269189) without success *F. lugubris* is common in woodlands in the Duddon valley, right up to Seathwaite. Walking down the valley from Seathwaite on 19 September I saw numerous nests of *F. lugubris* in a great variety of situations, from sunny exposed slopes to damp shady woodlands, and found *Formicoxenus* males on one nest near Tongue Wood (NY225963) (VC69). At Wallowbarrow (NY219964) (VC70) I also found males on one nest, and a slightly larger individual which proved to be a worker. This confirms the presence of *Formicoxenus* in nests of *Formica lugubris* in both vice-counties of Cumbria.

References

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SHORT COMMUNICATIONS

Recent British records of *Gymnosoma nitens* Meigen (Diptera: Tachinidae) and some comments on its status in Britain—On 18.vi.1998 I swept a small yellow-bodied fly around the derelict yard of Woodlands Farm near Bexley (TQ446765, vice-county 16, West Kent). Although immediately recognizable as one of the globose tachinids (Phasiini) which parasitize heteropteran bugs, it wasn't until autumn that I got around to confirming its identity. Using the key by Belshaw (1993), it easily worked to a male of *Gymnosoma nitens*, a red data book 1 species.

Examining the Bexley specimen I thought it looked familiar and located two further specimens, both males, in my collection. They were collected by sweeping near White Downs, Surrey, 15.viii.1977, along with a third specimen, a female, now in the collection of my father, A. W. Jones. At the time they had been misidentified using the key by van Emden (1954) as the similar-sized *Cistogaster globosa* (Fab.) the key did not include *G. nitens*. Two specimens were exhibited under this incorrect name at the 1977 BENHS annual exhibition (Jones, 1978).

The single record for *G. nitens* listed by Belshaw (1993)—Happy Valley, near Boxhill, Surrey, 1956—has since been added to. Plant (1996) and Plant & Smith (1996) reported two specimens from Grays, South Essex and one from Sandwich, Kent. In addition, the fly has turned up on other Essex sites on the north bank of the Thames Estuary (C. W. Plant, personal communication) and Clemons (1999) reports finding it in 1985 and 1996 in Kent.

In a recent paper, Morris (1997) reviewed the status of *Gymnosoma rotundatum* (L.), and reported that it too had recently become more widely and more often recorded. It started to appear more regularly in the 1950s, and during the 1970s, 80s and 90s has increased tremendously. Morris suggested the increase may be linked to the recent spate of hot dry summers. He did not give any further climatic information; the data he reported were collated by decade and it would be difficult to match precise yearly weather to this scheme. But his suggestion seems entirely feasible.